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Russian Far East Lymantriid Monitoring Project

Project Summary 1995



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COOPERATORS

United States Forest Service, Forest Health Protection
United States Animal and Plant Health Inspection Service
Federal Forest Service of Russia
State Plant Quarantine Inspection of Russian Federation

1995 RUSSIAN FAR EAST LYMANTRIID MONITORING PROGRAM

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Prepared by

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ABSTRACT

A cooperative monitoring program began in 1993 to determine population levels and flight periodicity in Russia's Far Eastern ports. Three Lymantriid species, Asian gypsy moth, *Lymantria dispar* (L.), Nun moth, *L. monacha* (L.), and Rosy gypsy moth, *L. mathura* Moore were assessed using a variety of monitoring techniques. This information has been used to develop a database to determine infestation level and regulatory risk associated with ships and cargo within the ports.

The largest increase in pheromone trap catches occurred in the port of Vladivostok. The average trap catch of Asian gypsy moth (AGM) has increased from 58.3 and 76.5 in 1993 and 1994 to 363.2 in 1995. Pheromone trap averages of AGM have also increased since 1993 in the ports of Nakhodka (1993-10.8 to 1995-17.7) and Vostochny (1993-3.7 to 1995-42.9), but not as significantly. Nun moth and Rosy gypsy moth populations remain at endemic levels in all ports. Most of the Nun moth catches occurred in Vladivostok. Pheromone traps in Vladivostok averaged 12.2 Nun moths per trap in 1995, which is the same average catch recorded in the 1993 survey. In 1995, adult flight began mid to late July for Nun moth and AGM. Approximately a seven week flight period was recorded for both species. The egg mass stage of AGM was recorded for the first time near the ports of Vladivostok and Nakhodka.

INTRODUCTION

In 1993, a cooperative monitoring program was initiated by Russia and the United States to determine population levels and flight periodicity of three Lymantriid species (Asian gypsy moth, *Lymantria dispar* (L.), Nun moth, *L. monacha* (L.), and Rosy gypsy moth, *L. mathura* Moore), in the port areas of Russia's Far East. The federal agencies participating in this joint effort include: Federal Forest Service of Russia, State Plant Quarantine Inspection Service of Russia, United States Animal and Plant Health Inspection Service (APHIS), and United States Forest Service. A variety of monitoring techniques were used to conduct this evaluation. A report by Munson et. al. (1995) summarized the monitoring program for 1993 and 1994.

All three species were at endemic levels within the monitored ports of Nakhodka, Vostochny and Vladivostok in 1993. The forest survey area for all ports extends 20 kilometers (12.5 miles) from port boundaries. Federal Forest Service of Russia is responsible for all monitoring activities beyond port boundaries. Within the ports, State Plant Quarantine Inspection of Russia is responsible for monitoring activities. Aside from the three major ports, three smaller secondary ports were also monitored by State Plant Quarantine Inspection of Russia: Vanino, Olga and Petropavlovsk. No forest monitoring was conducted in the three smaller ports.

OBJECTIVES

1. Develop and implement a system to assess and reduce the risk of *Lymantria* introduction into North America.
2. Monitor *Lymantria dispar*, *L. monacha*, and *L. mathura* population levels in and around Russian Far Eastern ports that have ships commuting between the Russian Far East and North America.
3. Determine when ships are at risk of infestation.
4. Use survey information to trigger mitigation measures when unacceptable levels of risk are reached (i.e., increased ship inspections, revision of exclusion guidelines and reduced port and ship lighting).
5. Construct a database that can be used to determine when control measures are needed to suppress populations in and around ports.
6. Open lines of technology and information transfer regarding pest risk assessment and control. Compile a database for Asian gypsy moth (AGM) and other *Lymantria* species that includes information on life cycles, host ranges, geographic distribution, outbreak cycles, natural enemies and management practices.

METHODS

FOREST AREA MONITORING

Within the forest areas, two monitoring zones were established around each of the three principal ports (Vladivostok, Nakhodka and Vostochny).

Zone 1 - Adult male populations were monitored using gypsy moth pheromone baited traps (milk carton type) in a five-kilometer (3.1 miles) radius around each port. In forested sites, traps were placed along designated trapping routes (trap lines) up to five kilometers in length at 800 m (2,600 ft.) intervals. Distance between trap lines was two kilometers (1.2 miles).

Zone 2 - Adult populations were monitored using gypsy moth pheromone traps (milk carton type) within a 15 kilometer (9.3 mile) radius surrounding Zone 1. Procedures to place traps were similar to those described for Zone 1, except distance between trap lines was six kilometers (3.75 miles) rather than the two-kilometer spacing used to place traps in Zone 1. Number of traps deployed for both Zones is summarized in Table 1.

Table 1. Pheromone traps deployed in forested sites for Zones 1 and 2 in 1995.*

	Zone 1	Zone 2
Vladivostok	29	63
Nakhodka	54	92
Vostochny	28	60

*Traps destroyed, lost, or broken are not included in Table.

In both Zones, all accessible traps were checked twice each week to record number of AGM adults trapped between each visit. Traps in inaccessible locations were checked once every two weeks. Nun moths captured within pheromone traps were also counted. Other Lymantriid species were counted but not identified. One light trap was established in each of the forested areas surrounding each port. Each light trap was serviced daily during adult flight dispersal to record species, number and sex of adult moths for the three Lymantriid species cited previously.

One to four permanent plots were established within forested Zones surrounding each port. Permanent plots were one hectare in size (2.47 acres) in which 30 host trees greater than 12.7 cm (5 inches) in diameter were banded. Banded trees were inspected twice each week to record larval and pupal stages of the three Lymantriid species mentioned previously.

Egg mass surveys were conducted using fixed- and variable-radius plots in areas where trap catches exceeded 50 or more moths per trap. A fixed-radius plot of 2.52 m (8.26 ft.) was established at each site to inspect all substrates for egg masses. A variable-radius plot (20 BAF) was also established using the same plot center to select over story trees for egg mass surveys.

PORT AREA MONITORING

Within the port areas, State Plant Quarantine Service of Russia monitored 20 pheromone traps in the three principal ports and 10-15 pheromone traps in the smaller ports of Vanino, Olga and Petropavlovsk. Five black light traps were placed in each of the principal ports during adult dispersal to record flight activity of the three Lymantriid species. Up to ten, one meter square, egg mass monitoring stations at each port were selected in sites where egg masses had been deposited previously. Egg mass deposition sites were checked daily to record number and species of egg masses deposited. Only milk carton pheromone traps were deployed in the smaller ports.

Data Analysis - Pheromone trap and permanent plot locations were recorded on 1:50,000 scale maps. Trap data was digitized and entered into a Geographic Information System (GIS). Pheromone and light trap data was summarized in tabular and graphic format for reporting purposes. A risk assessment was conducted for each port using the collected life stage information for both port and forested areas. Data was used to determine thresholds for suppression efforts, and to modify or adjust APHIS's vessel exclusion policy.

RESULTS & DISCUSSION

Asian Gypsy Moth - In the forest areas, the first 1995 AGM adult was caught July 22 in Vladivostok's Zone 1. In most of the other zones surrounding Level 1 ports, adult flight began July 30 (Figures 1 and 2). The only exception was Nakhodka's Zone 1, where the first male moth was caught August 6 (Figure 3).

In 1995 within the port areas, AGM adult flight began the week of July 14 in Vladivostok (Figure 4). In Nakhodka flight began the week of July 21 (Figure 5) and in Vostochny and Olga, July 28 (Figure 6 and 7). Because week one trap observations varied by year, weekly observations and corresponding dates are displayed in Table 2.

Peak flight for AGM occurred August 4 through August 18 for all ports. No moths were caught in Petropavlosk and only five adult males were recorded in pheromone traps in Vanino. Flight duration averaged seven weeks in all ports. The largest increase in pheromone trap catches was recorded in Vladivostok. Table 3 summarizes 1995 pheromone trap catches for the three Level 1 ports and compares 1995 averages to 1994.

Table 2. 1995 Dates of pheromone trap observations.

	1995
Week 1	July 1 - July 28
Week 2	July 29 - August 4
Week 3	August 5 - August 11
Week 4	August 12 - August 18
Week 5	August 19 - August 25
Week 6	August 26 - September 1
Week 7	September 2 - September 8
Week 8	September 9 - September 15
Week 9	September 16 - September 22

Table 3. Pheromone trap summaries for AGM in Level 1 ports and 1994 comparisons.

	Total AGM	95 Ave. / Trap	Percent +/-1994
Vladivostok	33,419	363.2	+79
Nakhodka	2,581	17.7	+48
Vostochny	3,775	42.9	+84

In 1994, trap catches in Vladivostok averaged 76.5 moths per trap and in 1995, traps averaged 363.2 moths (79 percent increase). Although trap catches increased by 84 percent in Vostochny, the overall trap catch was only 3,775 moths, compared to the 33,419 caught in Vladivostok pheromone traps. The highest male moth catch in a single trap occurred in Zone 2 of Vladivostok, in which 1,148 moths were caught (Figure 8). Between 1994 and 1995, the most significant increase in male moth catches in all forest Zones occurred in Zone 2 of Vladivostok (Figure 9). In Nakhodka and Vostochny, the highest pheromone trap catches were recorded in Zone 2 for both ports (Figures 10 and 11).

Two light traps were installed in the forested zones and monitored from July 15 to September 15. One was placed 16 km (10 miles) from Vladivostok near Okeanskaya and the other 18 km (16.2 miles) from Nakhodka and Vostochny near Vladimiro-Aleksandrovskoe. Sixty-eight males were caught in the Vladivostok light trap and 10 males and two females were collected in the Nakhodka-Vostochny light trap.

Fall egg mass surveys were conducted within 270 variable radius plots. The egg mass stage was recorded for the first time in 1995. Five egg masses were found near pheromone trap sites in the forested zone surrounding the port of Vladivostok. Egg masses were also detected in three of the permanent plot sites near Vladivostok. In Nakhodka, 282 lamp posts were inspected and two egg masses were found. No egg masses were recorded near the port of Vostochny. Egg mass sizes were large according to Russian scientists, which indicates a building population.

Nun Moth - Adult flight in 1995 began the week of July 20 in Vladivostok and July 29 in Vostochny and Nakhodka. Peak flight occurred July 29 to August 26 for all three major ports. Most of the adult moths were collected in pheromone traps in the border area separating Zones 1 and 2 in Vladivostok (Figures 12 and 13). Trap catches averaged 12.2 moths in Vladivostok, which is the same average number of moths caught per trap in 1993 (Table 4).

Table 4. Pheromone trap summaries for Nun moth in Level 1 ports and 1994 comparisons.

	Total Nun Moth	1995 Avg. / Trap	Percent +/- 1994
Vladivostok	1,125	12.2	+48
Nakhodka	4	0.03	-85
Vostochny	9	0.10	+40

In Nakhodka and Vostochny, most of the traps had no catches or reduced numbers compared to 1993 catches (Figures 14 and 15). Pheromone trap catches decreased overall in Nakhodka and Vostochny compared to 1993 average trap catches.

Rosy Gypsy Moth - Populations of this Lymantriid have consistently been the lowest of the three monitored species. Since Rosy gypsy moth males do not respond to (+)disparlure, no adult moths were caught in pheromone traps. Although populations remain at endemic levels, Rosy gypsy moth adults were collected in Vladivostok light traps from July 20 to August 4. Single larvae or pupae were found in permanent plots near Vladivostok and Nakhodka. Egg laying females were observed near permanent plot number five, in the Nakhodka forest region.

CONCLUSION

Although no suppression efforts will be conducted in 1996, the monitoring program will be continued until AGM populations reach outbreak proportions. This permits an assessment of the monitoring strategies to determine if any of these techniques can effectively predict population outbreaks.

In addition to the monitored ports, increasing populations of AGM have been recorded in the Khabarovsk and Amur Regions. Russian entomologists believe AGM populations will reach outbreak status in the forested area of Vladivostok in 1997. Populations of AGM have moved from the latent-phase to the post-outbreak phase in 1995. This prediction is based on pheromone trap catches, egg mass surveys and observations of Russian scientists.

ACKNOWLEDGEMENTS

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Figure 1. 1995 Average Trap Catches for *L. dispar* & *L. monacha* by FFSR in Vostochny

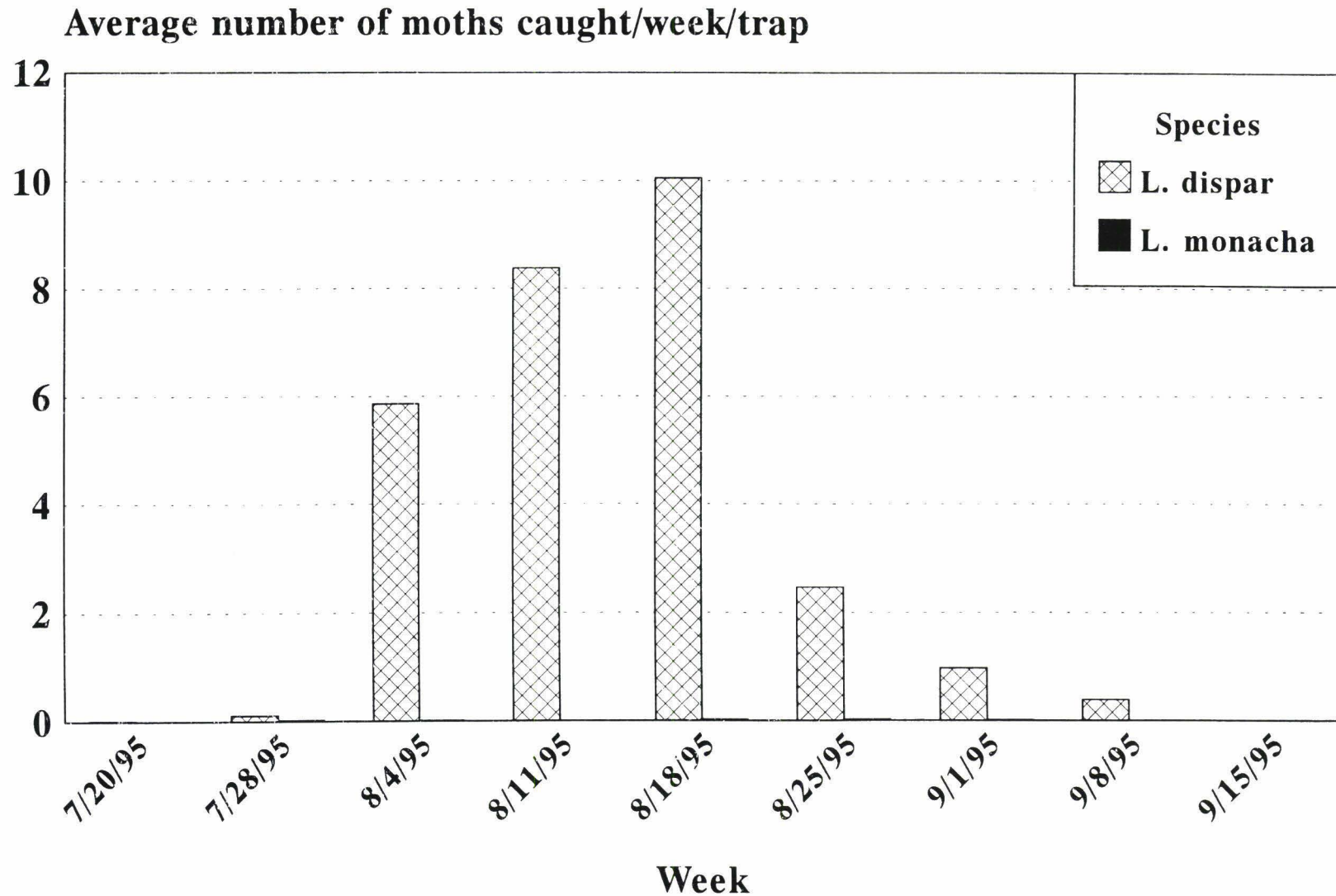


Figure 2. 1995 Average Trap Catches for *L. dispar* & *L. monacha* by FFSR in Vladivostok

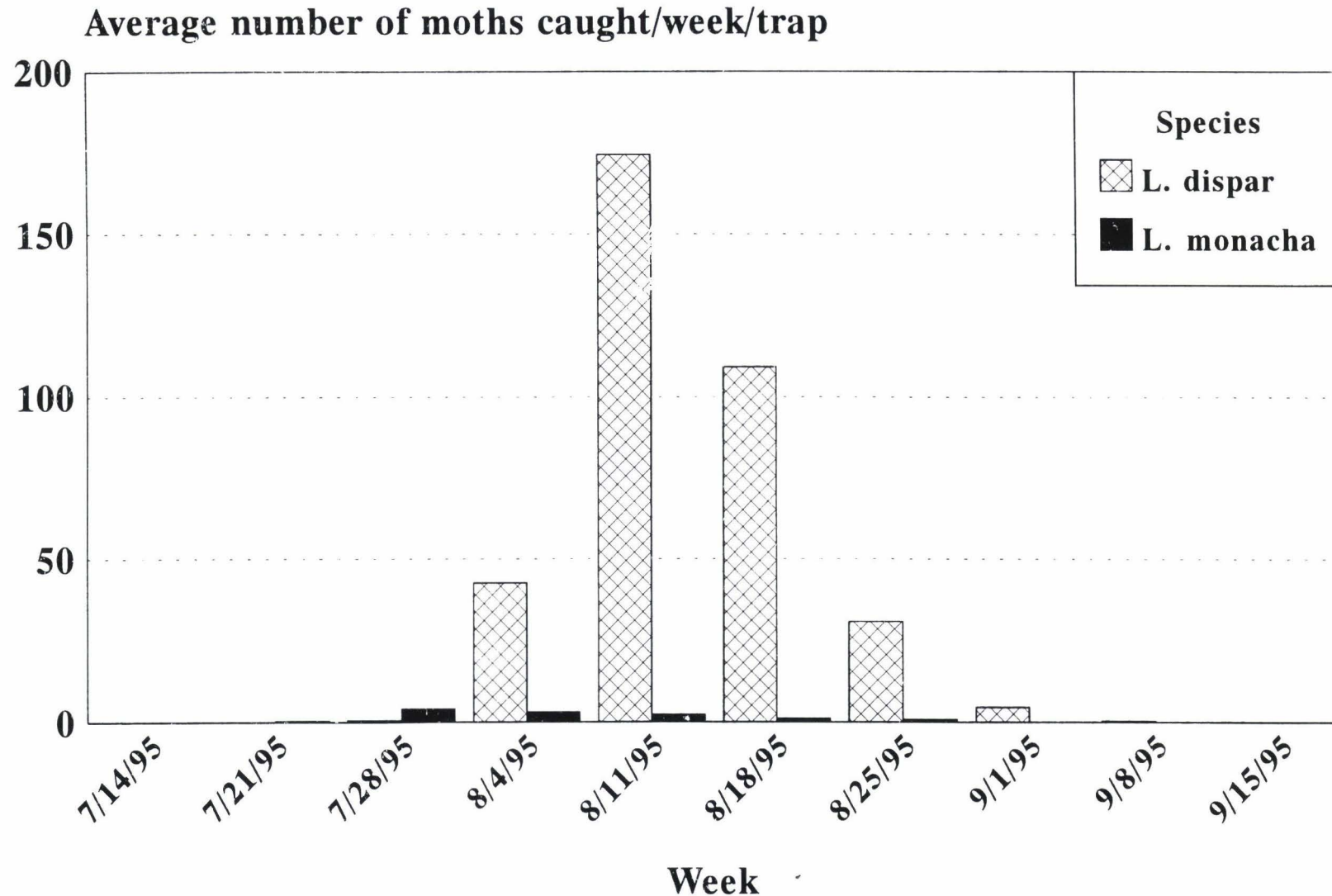


Figure 3. 1995 Average Trap Catches for *L. dispar* & *L. monacha* by FFSR in Nakhodka

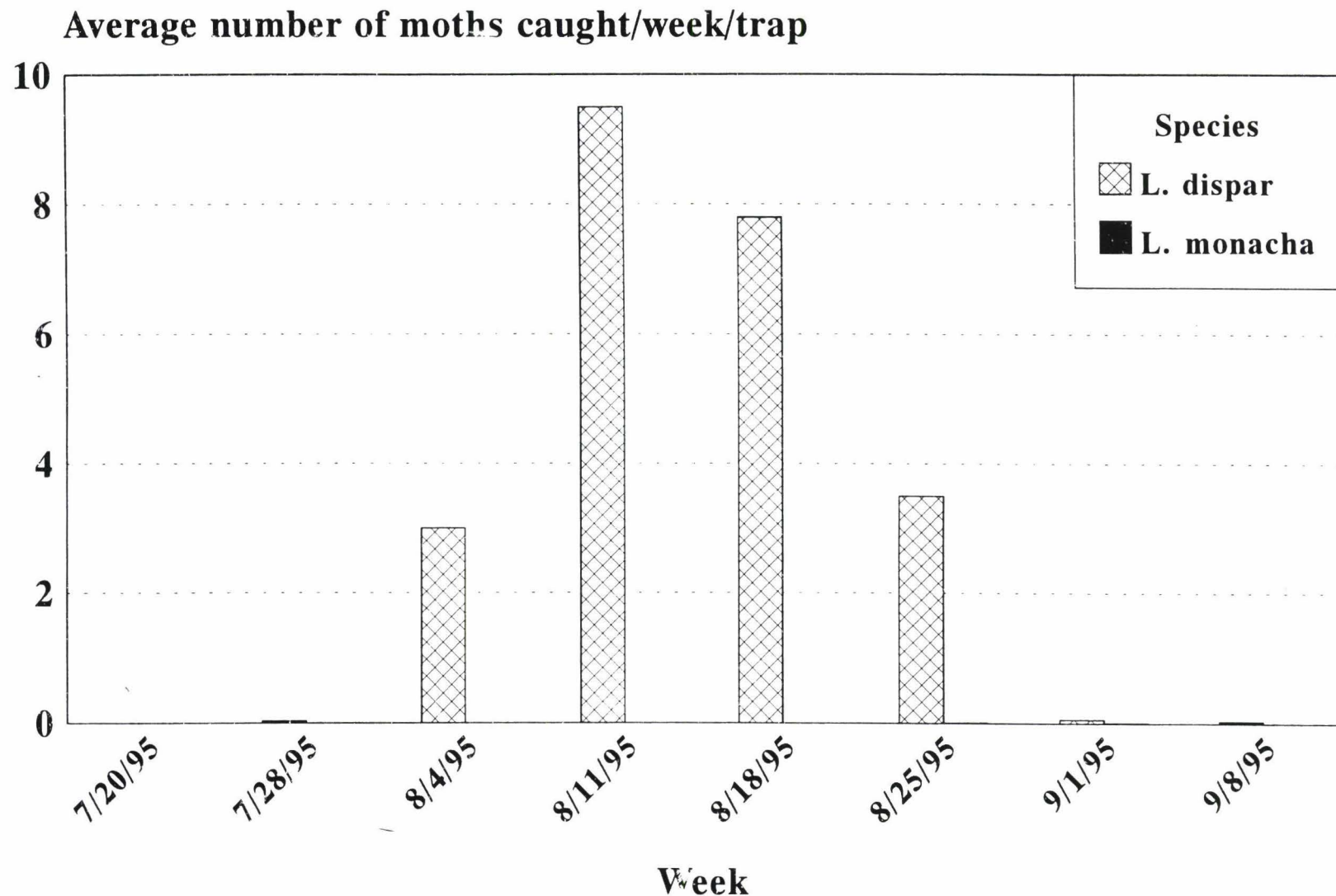


**Figure 4. 1995 Average Trap Catches for L.dispar
by PQIS within the Port of Vladivostok**

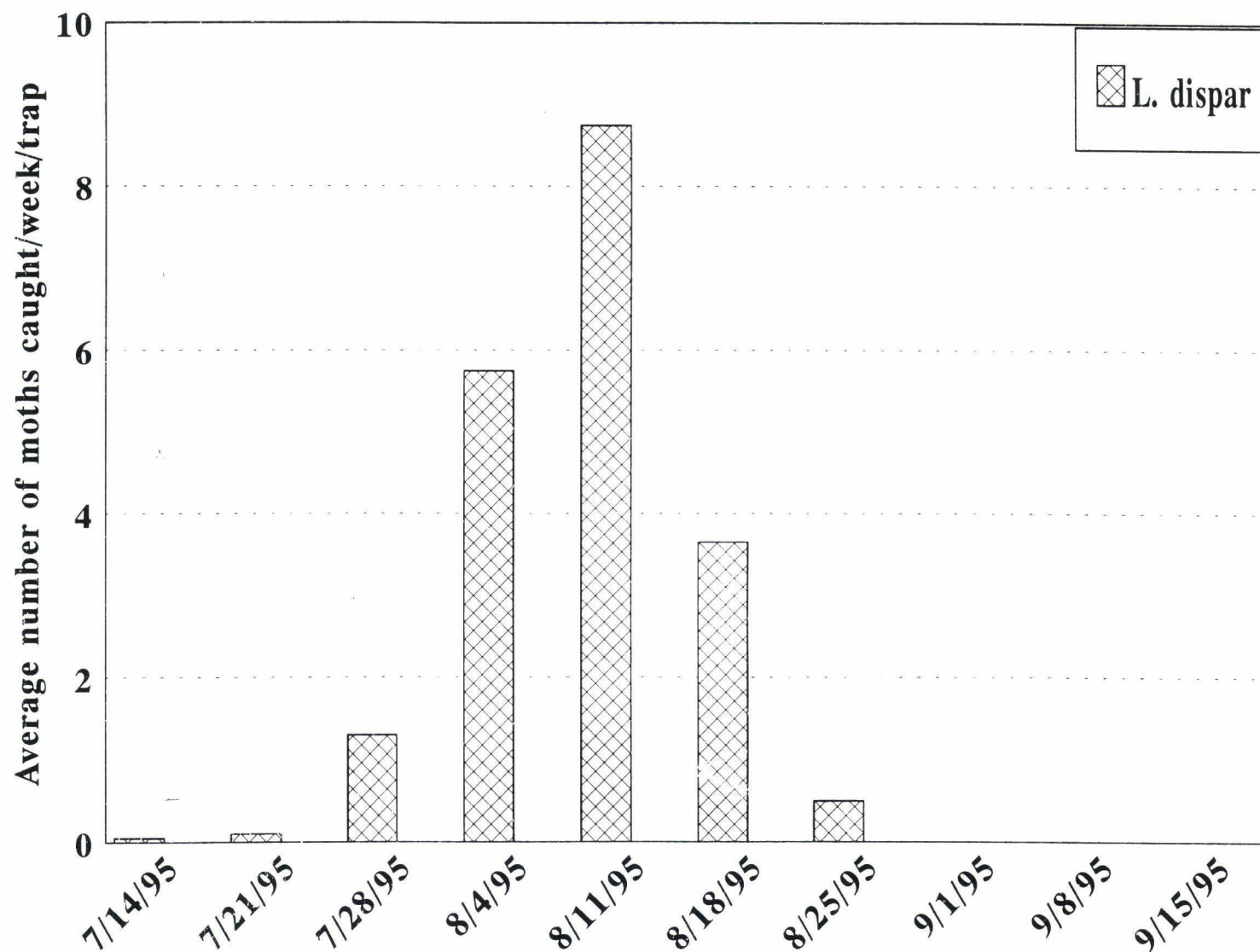


Figure 5. 1995 Average Trap Catches for *L. dispar* by PQIS within the port of Nakhodka

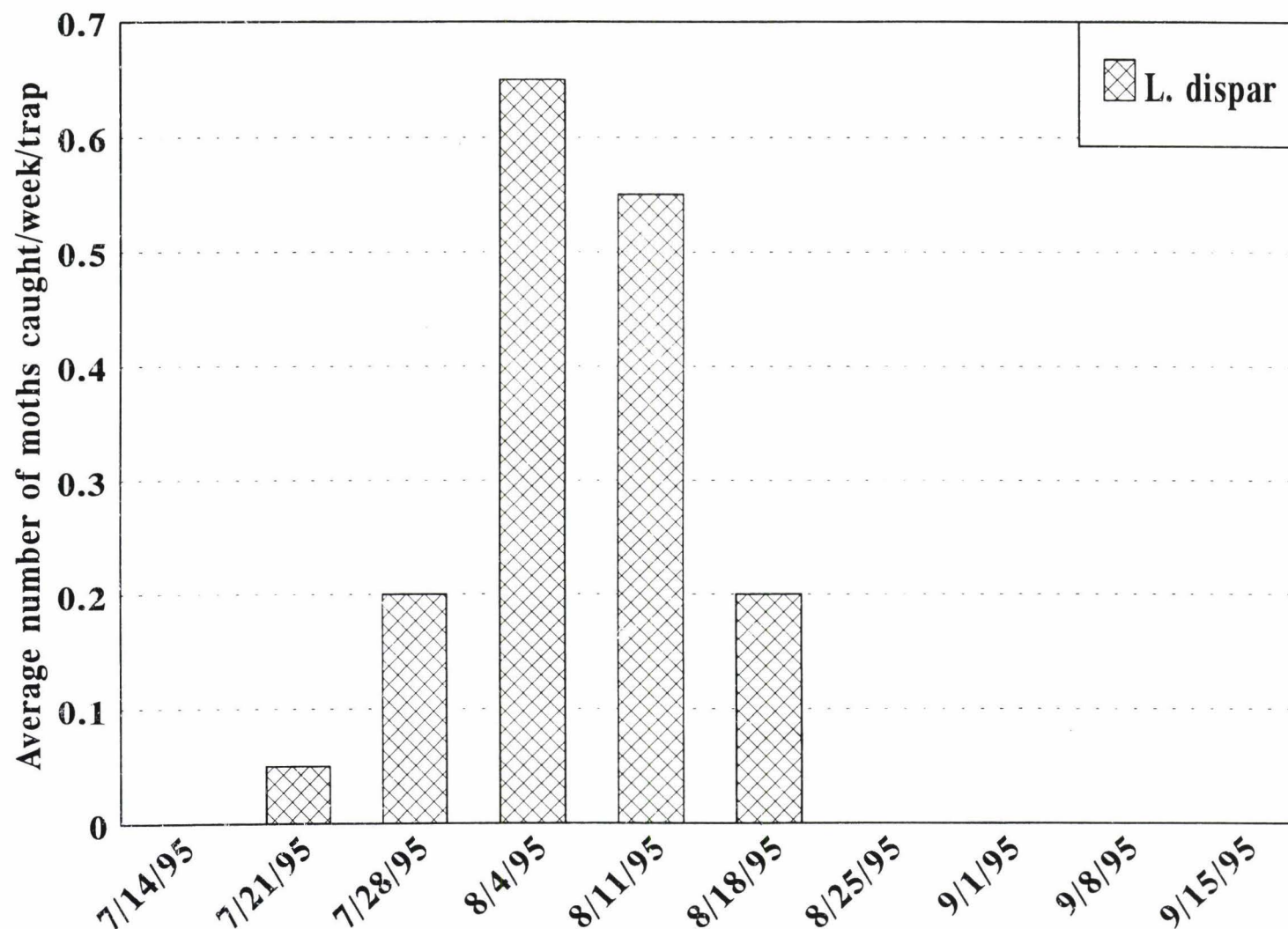


Figure 6. 1995 Average Trap Catches for *L. dispar* & *L. monacha* by PQIS within the Port of Vostochny

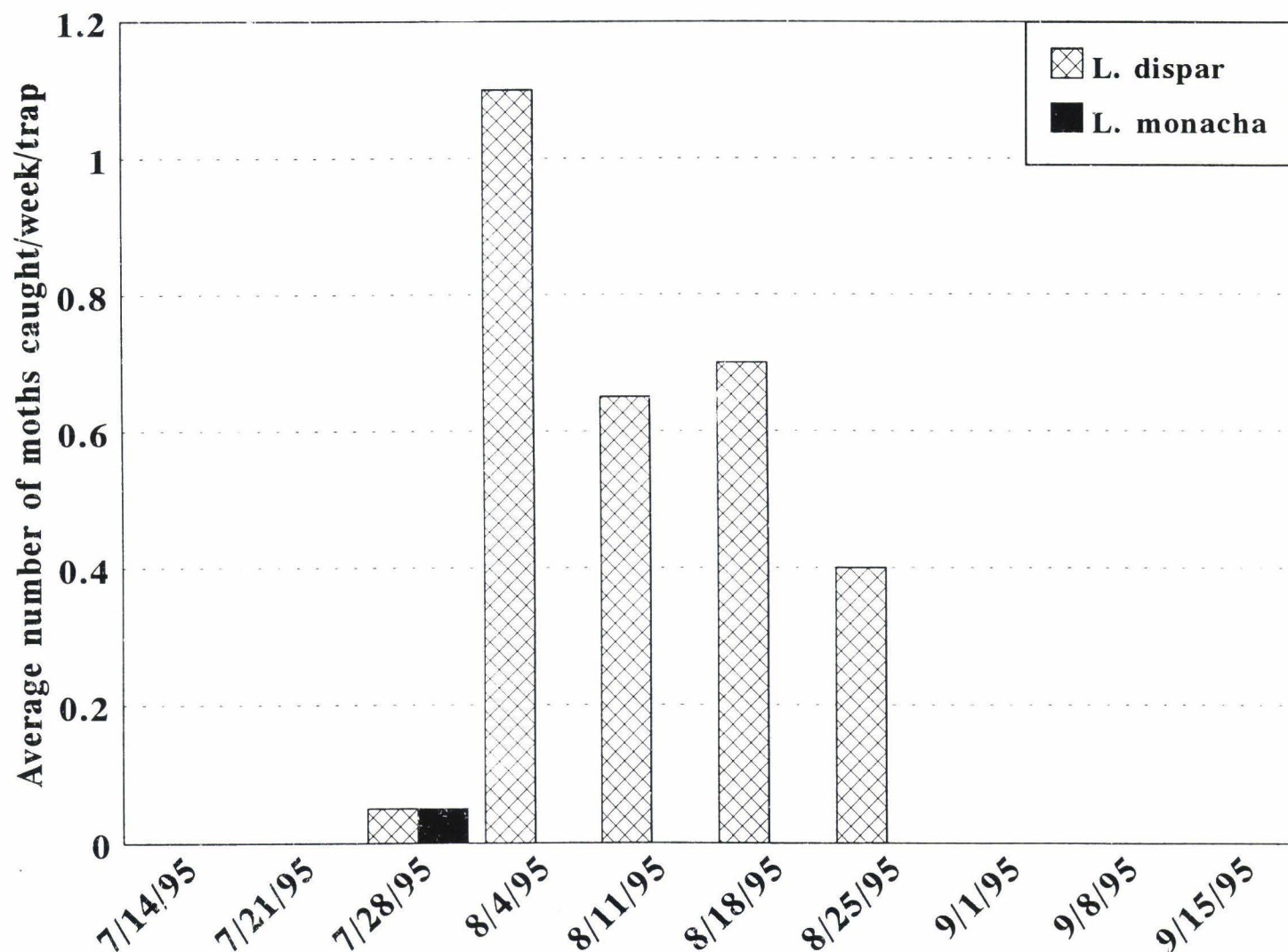


Figure 7. 1995 average trap catches for *L. dispar* & *L. monacha* by PQIS within the Port of Olga

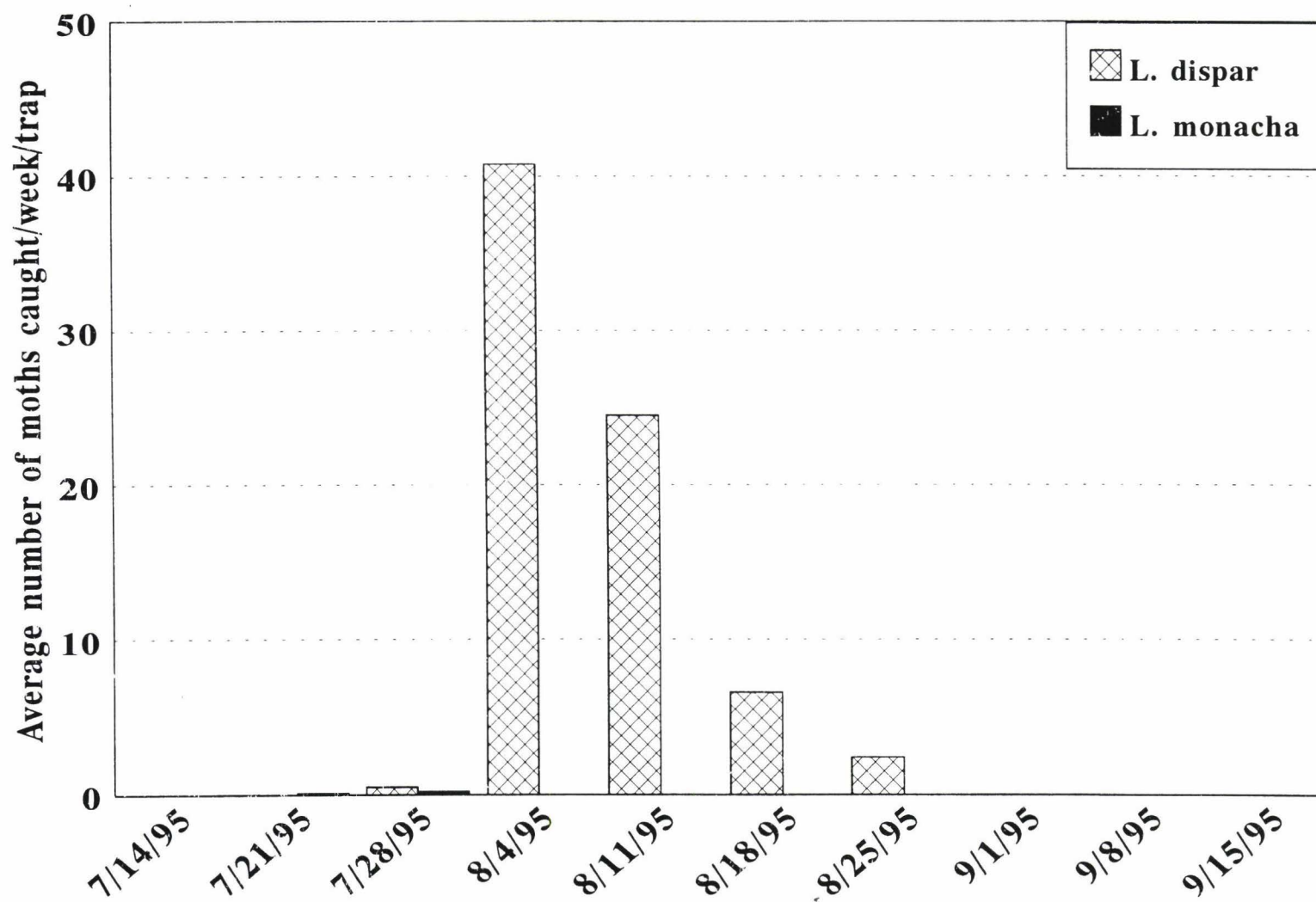


Figure 8.

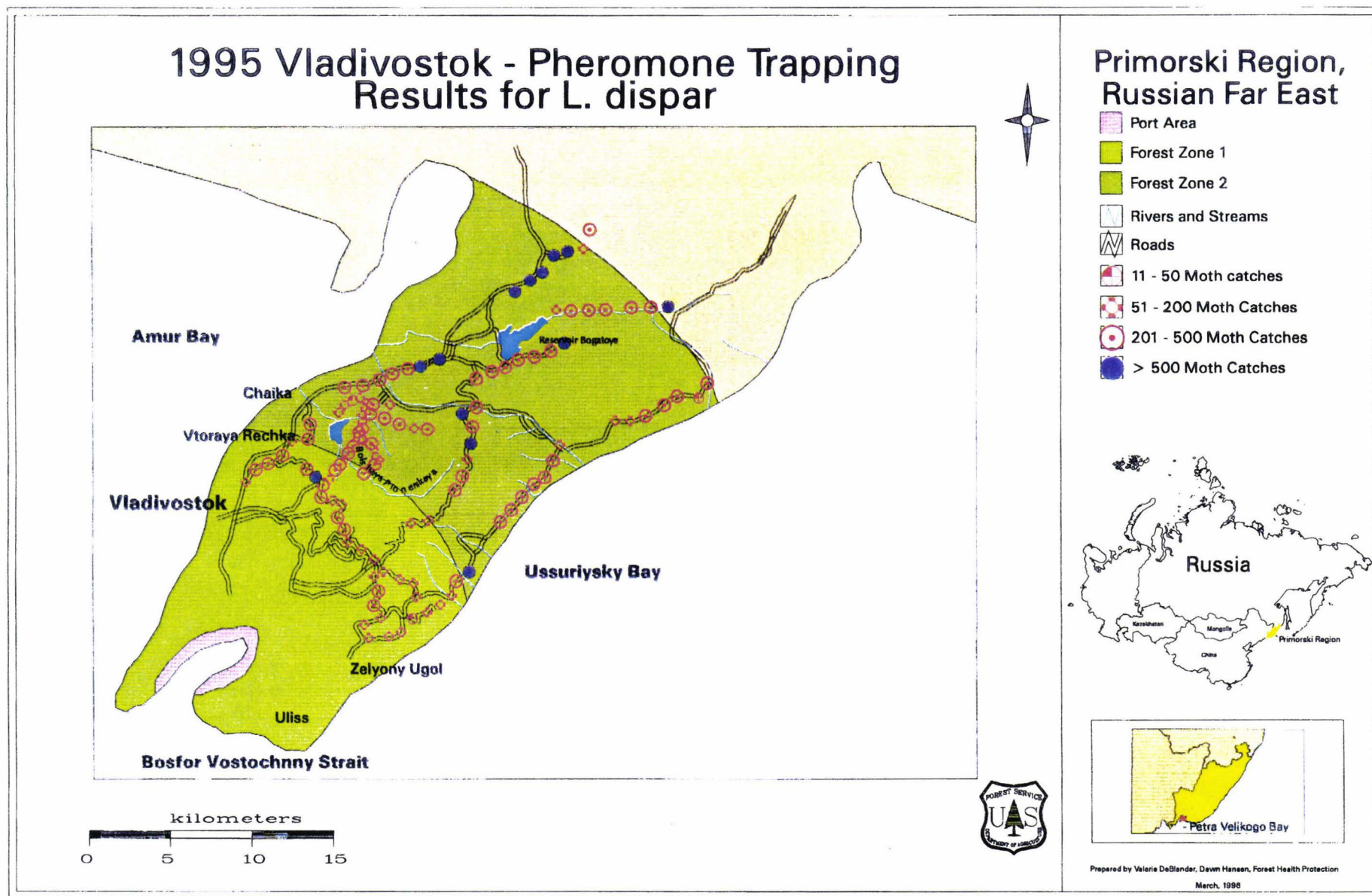


Figure 9.

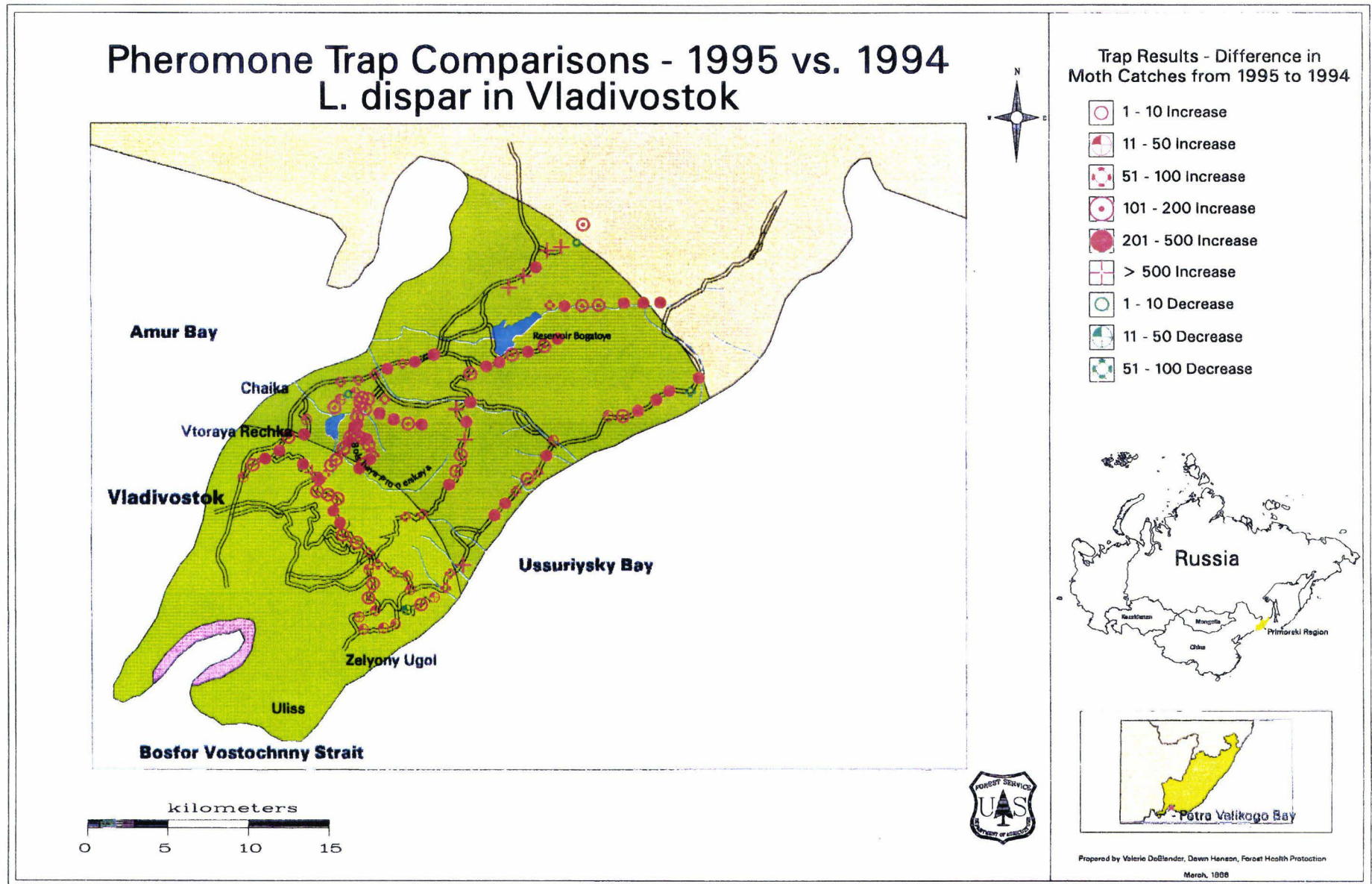


Figure 10.

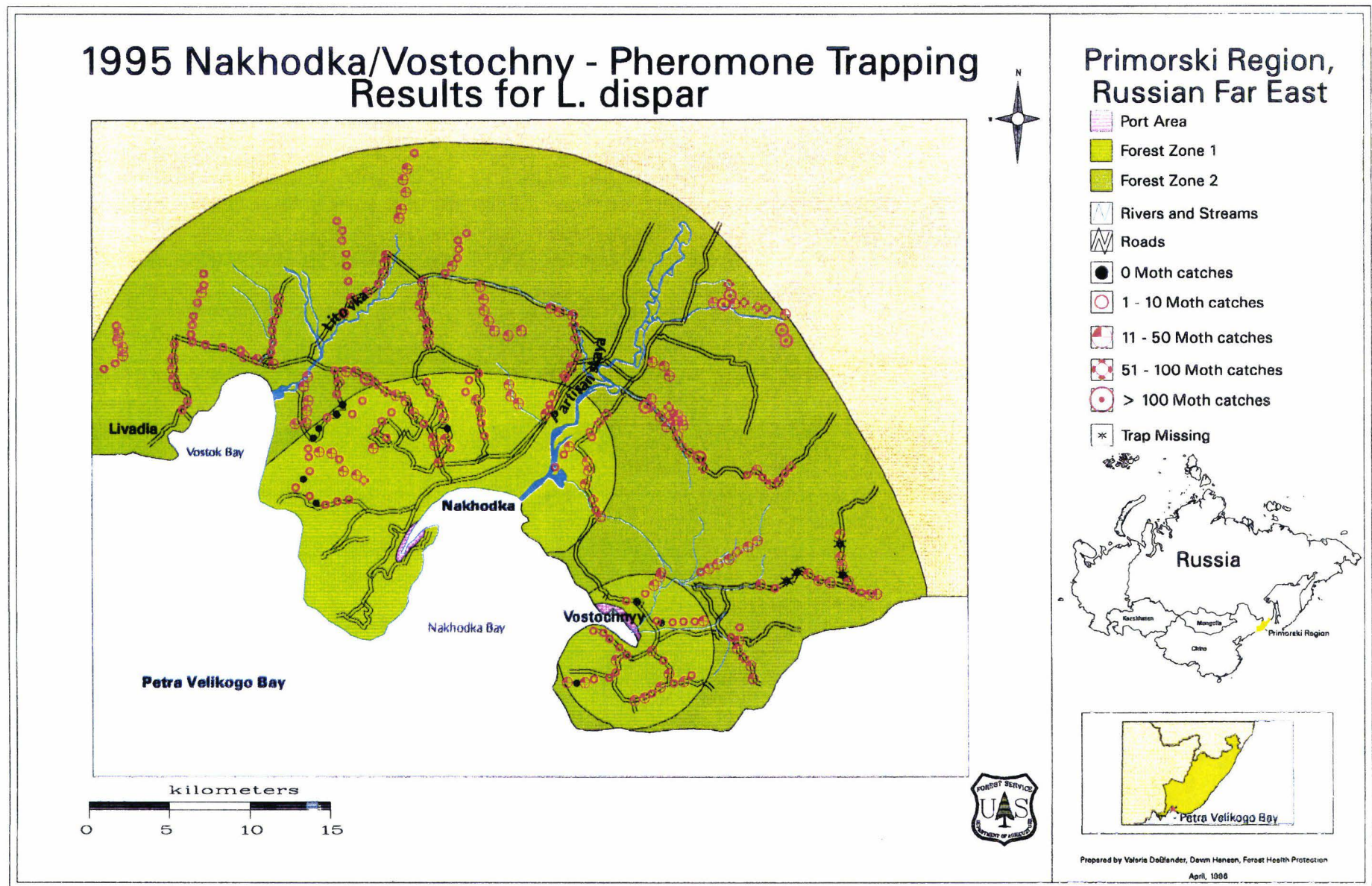


Figure 11.

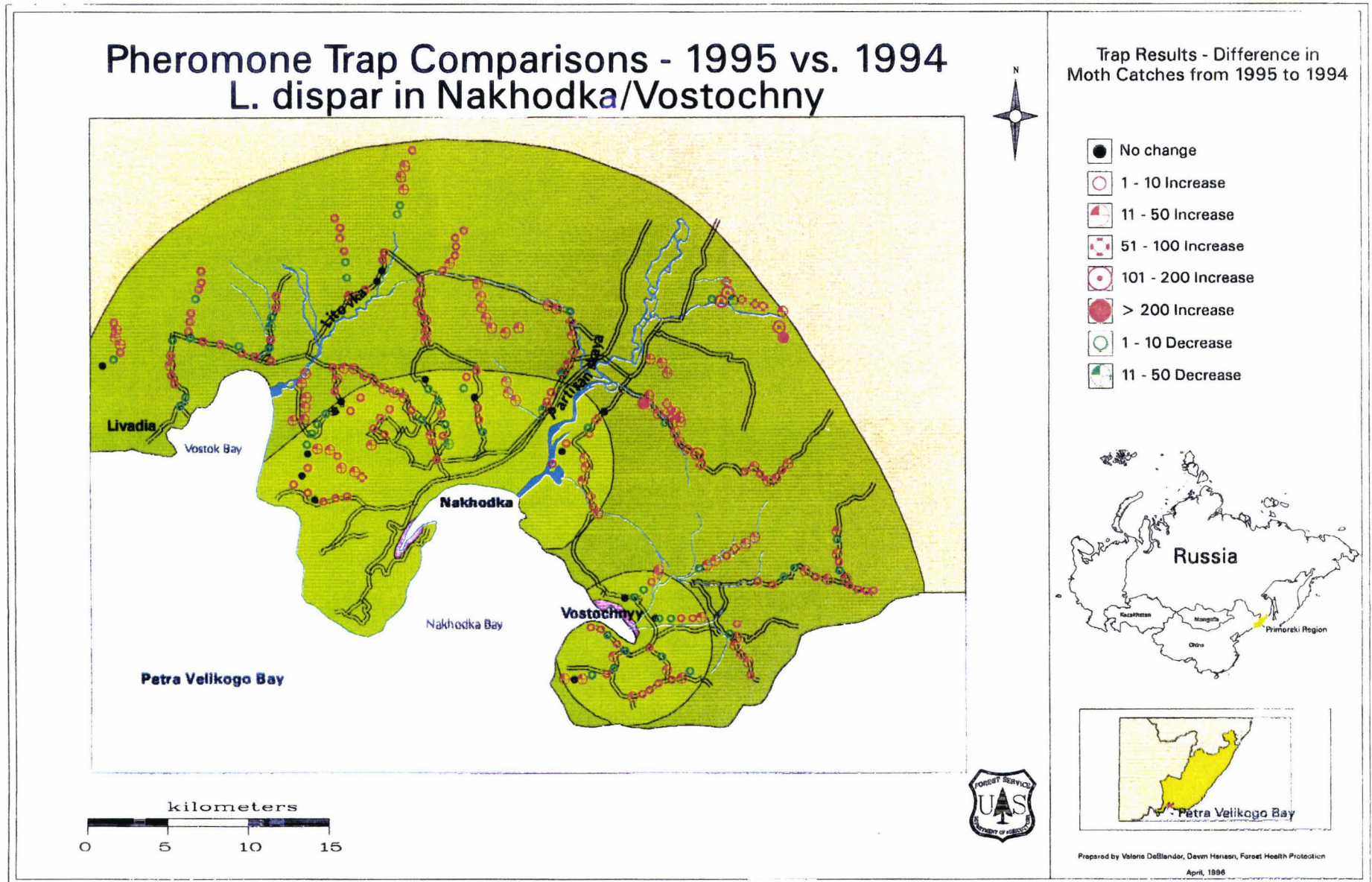


Figure 12.

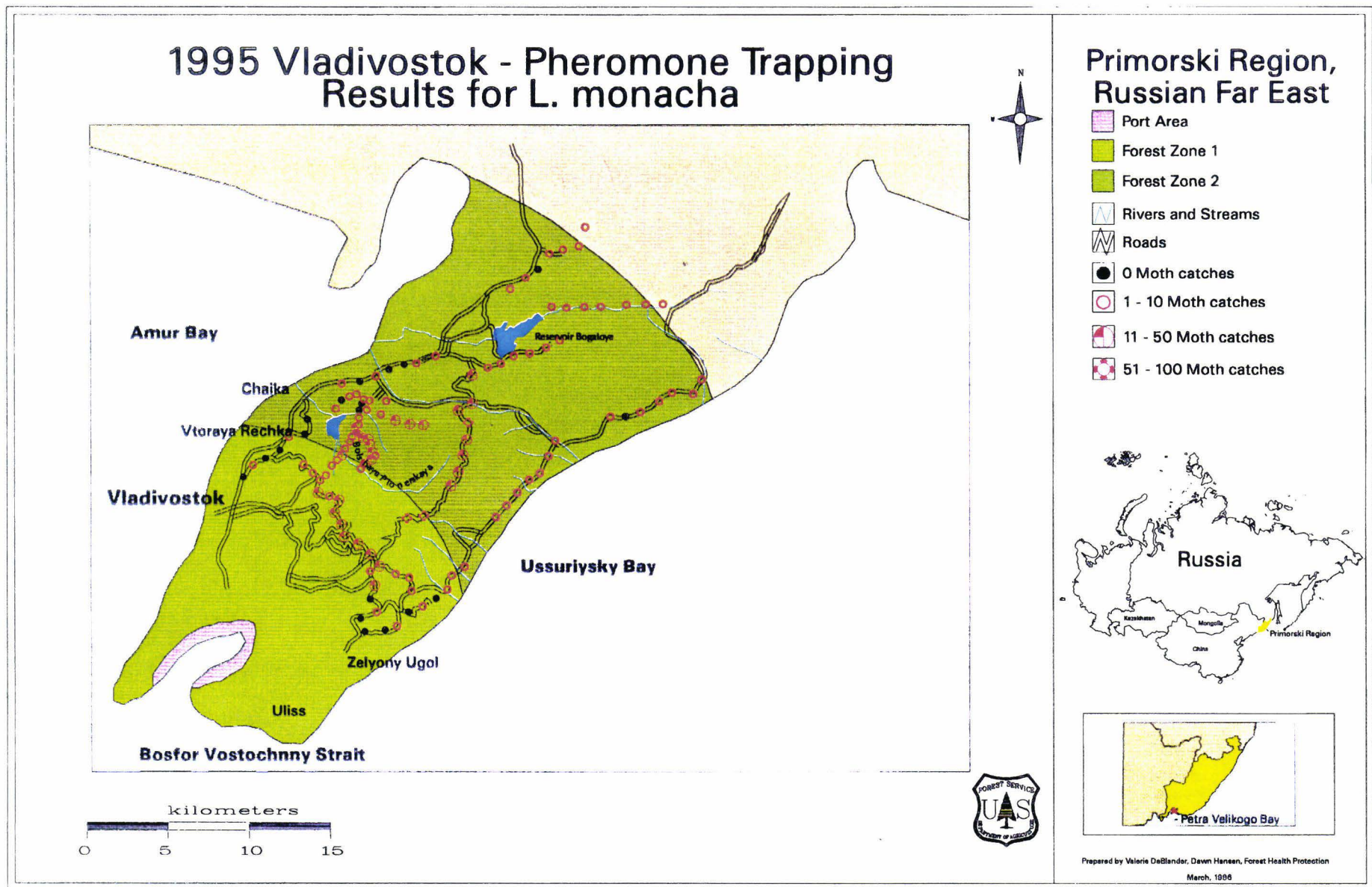


Figure 13.

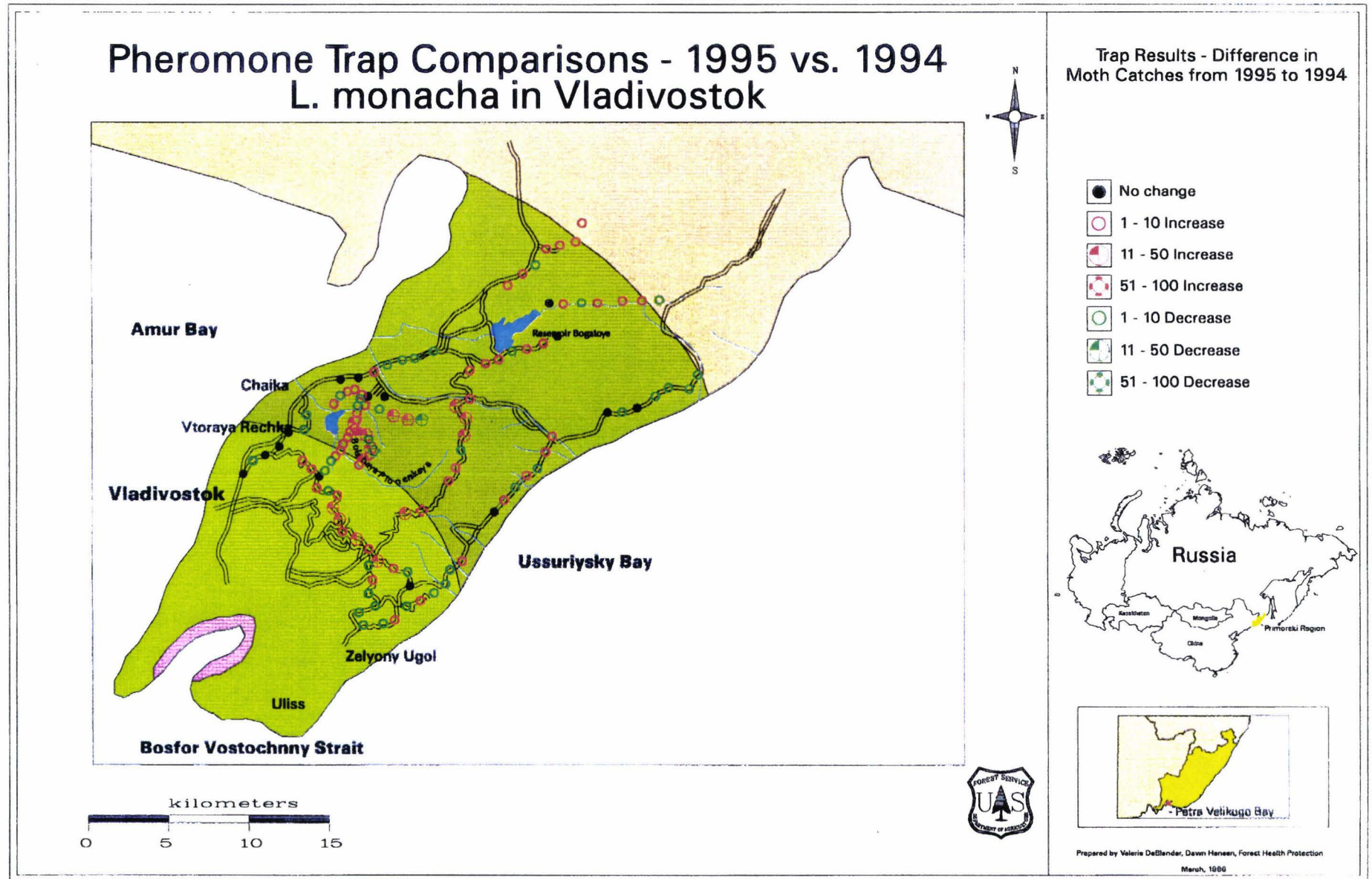


Figure 14.

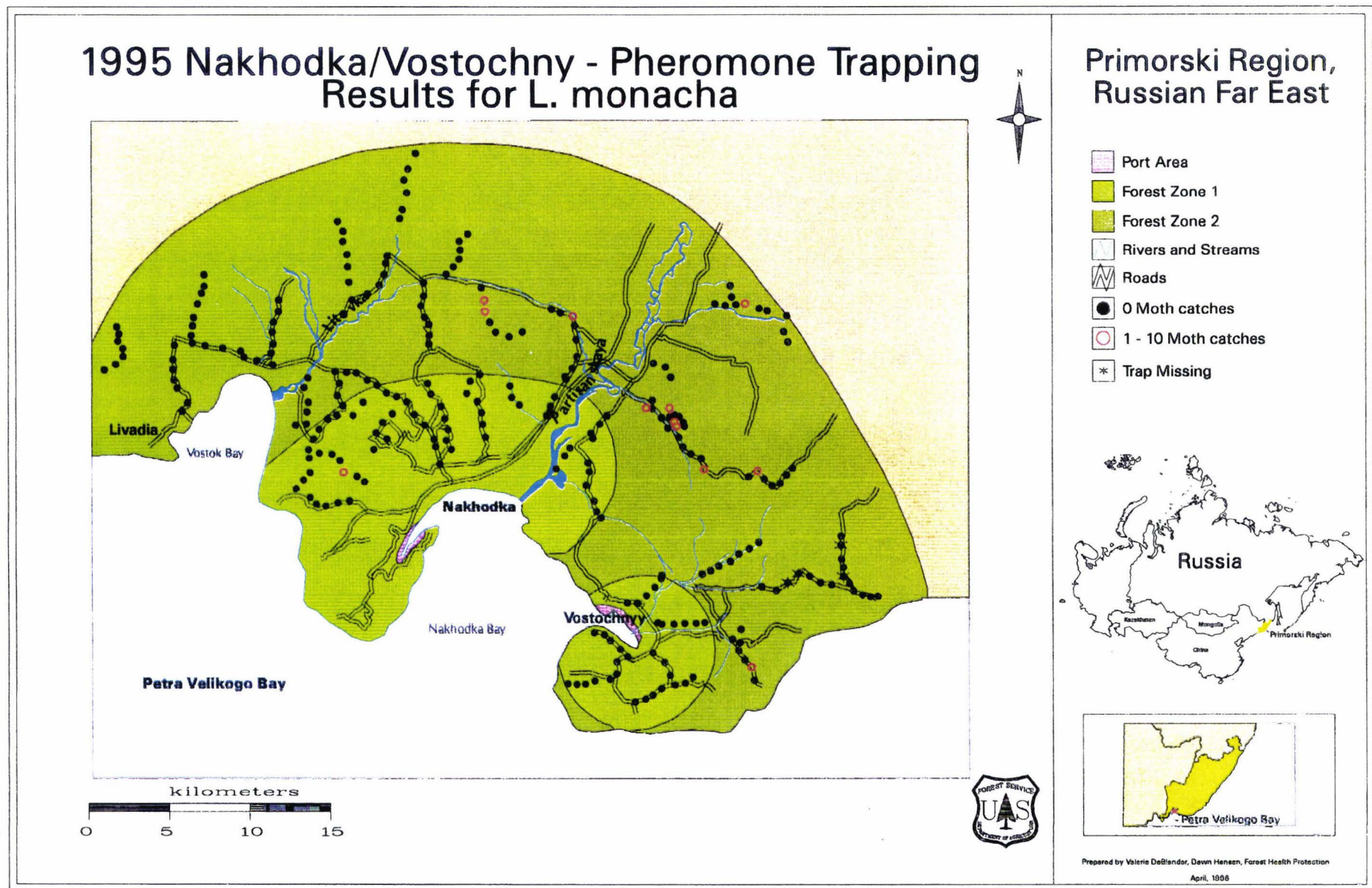


Figure 15.

